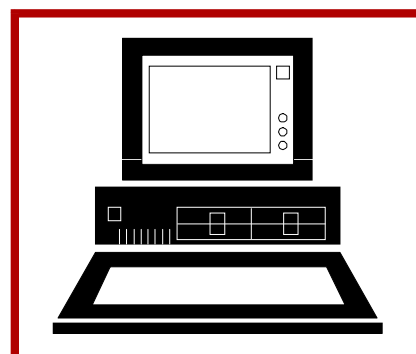
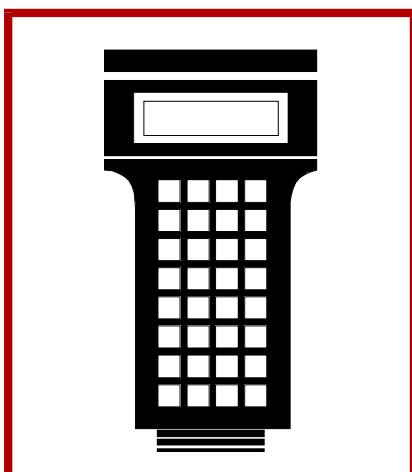
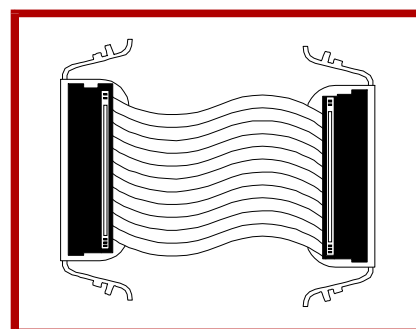
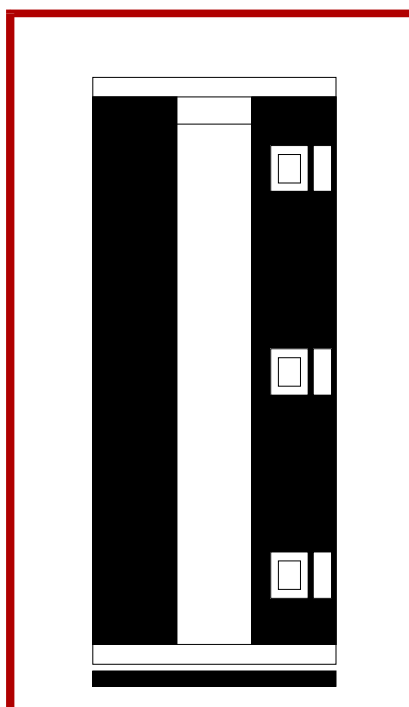
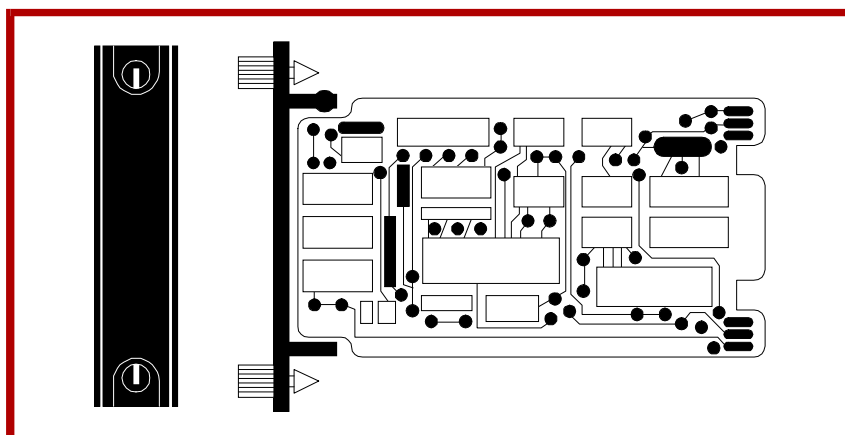
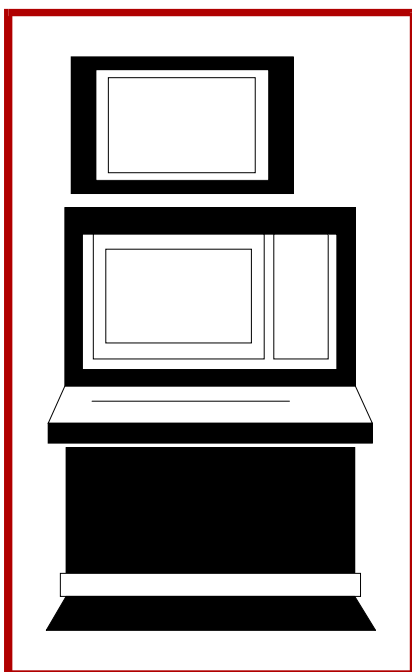


E96-215

Bailey®
infi 90

Instruction

Quick Response Controller (IMQRC01)



WARNING notices as used in this instruction apply to hazards or unsafe practices that could result in personal injury or death.

CAUTION notices apply to hazards or unsafe practices that could result in property damage.

NOTES highlight procedures and contain information that assists the operator in understanding the information contained in this instruction.

WARNING

INSTRUCTION MANUALS

DO NOT INSTALL, MAINTAIN, OR OPERATE THIS EQUIPMENT WITHOUT READING, UNDERSTANDING, AND FOLLOWING THE PROPER **Elsag Bailey** INSTRUCTIONS AND MANUALS; OTHERWISE, INJURY OR DAMAGE MAY RESULT.

RADIO FREQUENCY INTERFERENCE

MOST ELECTRONIC EQUIPMENT IS INFLUENCED BY RADIO FREQUENCY INTERFERENCE (RFI). CAUTION SHOULD BE EXERCISED WITH REGARD TO THE USE OF PORTABLE COMMUNICATIONS EQUIPMENT IN THE AREA AROUND SUCH EQUIPMENT. PRUDENT PRACTICE DICTATES THAT SIGNS SHOULD BE POSTED IN THE VICINITY OF THE EQUIPMENT CAUTIONING AGAINST THE USE OF PORTABLE COMMUNICATIONS EQUIPMENT.

POSSIBLE PROCESS UPSETS

MAINTENANCE MUST BE PERFORMED ONLY BY QUALIFIED PERSONNEL AND ONLY AFTER SECURING EQUIPMENT CONTROLLED BY THIS PRODUCT. ADJUSTING OR REMOVING THIS PRODUCT WHILE IT IS IN THE SYSTEM MAY UPSET THE PROCESS BEING CONTROLLED. SOME PROCESS UPSETS MAY CAUSE INJURY OR DAMAGE.

AVERTISSEMENT

MANUELS D'OPÉRATION

NE PAS METTRE EN PLACE, RÉPARER OU FAIRE FONCTIONNER L'ÉQUIPEMENT SANS AVOIR LU, COMPRIS ET SUIVI LES INSTRUCTIONS RÉGLEMENTAIRES DE **Elsag Bailey**. TOUTE NÉGLIGENCE À CET ÉGARD POURRAIT ÊTRE UNE CAUSE D'ACCIDENT OU DE DÉFAILLANCE DU MATÉRIEL.

PERTURBATIONS PAR FRÉQUENCE RADIO

LA PLUPART DES ÉQUIPEMENTS ÉLECTRONIQUES SONT SENSIBLES AUX PERTURBATIONS PAR FRÉQUENCE RADIO. DES PRÉCAUTIONS DEVRONT ÊTRE PRISES LORS DE L'UTILISATION DU MATÉRIEL DE COMMUNICATION PORTATIF. LA PRUDENCE EXIGE QUE LES PRÉCAUTIONS À PRENDRE DANS CE CAS SOIENT SIGNALÉES AUX ENDROITS VOULUS DANS VOTRE USINE.

PERTURBATIONS DU PROCÉDÉ

L'ENTRETIEN DOIT ÊTRE ASSURÉ PAR UNE PERSONNE QUALIFIÉE EN CONSIDÉRANT L'ASPECT SÉCURITAIRE DES ÉQUIPEMENTS CONTRÔLÉS PAR CE PRODUIT. L'AJUSTEMENT ET/OU L'EXTRACTION DE CE PRODUIT PEUT OCCASIONNER DES À-COUPS AU PROCÉDÉ CONTRÔLE LORSQU'IL EST INSÉRÉ DANS UNE SYSTÈME ACTIF. CES À-COUPS PEUVENT ÉGALEMENT OCCASIONNER DES BLESSURES OU DES DOMMAGES MATÉRIELS.

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Preface

The purpose of this document is to provide the user with installation, configuration, operating and troubleshooting information on the INFI 90[®] Quick Response Controller (IMQRC01).

[®] INFI 90 is a registered trademark of the Elsag Bailey Process Automation.

List of Effective Pages

Total number of pages in this manual is 45, consisting of the following:

Page No.	Change Date
Preface	Original
List of Effective Pages	Original
iii through vii	Original
1-1 through 1-6	Original
2-1 through 2-6	Original
3-1 through 3-7	Original
4-1 through 4-3	Original
5-1 through 5-3	Original
6-1 through 6-1	Original
7-1 through 7-2	Original
8-1 through 8-1	Original
A-1 through A-3	Original
B-1 through B-3	Original
C-1 through C-1	Original
Index-1 through Index-2	Original

NOTE: On an updated page, the changed text or table is indicated by a vertical bar in the outer margin of the page at the changed area. A changed figure is indicated by a vertical bar in the outer margin next to the figure caption. The date the update was prepared will appear beside the page number.

Safety Summary

**GENERAL
WARNINGS****Equipment Environment**

All components, whether in transportation, operation or storage must be in a noncorrosive environment.

Electrical Shock Hazard During Maintenance

Disconnect power or take precautions to ensure that contact with energized parts is avoided when servicing.

Special Handling

This module uses Electrostatic Sensitive Devices (ESD).

Output Values During Startup, Reset and Certain Failure Conditions

The digital outputs of the module are de-energized during startup, reset, and certain failure conditions. Analog output values return to default values during startup, reset, and certain failure conditions. These default values are selected using switches mounted on the module circuit board. The control strategy should be designed to prevent personal injury, equipment damage and/or return the controlled system to a safe state if the module fails unexpectedly.

Sommaire de Sécurité

**AVERTISSEMENTS
D'ORDRE
GÉNÉRAL**

Environnement de l'équipement

Nes pas soumettre les composantes a une atmosphere corrosive lors du transport, de l'entreposage ou de l'utilisation.

Risques de chocs electriques lor de l'entretien

S'assurer de debrancher l'alimentation ou de prendre les precautions necessaires a eviter tout contact avec des composants sous tension lors de l'entretien.

Precautions de Manutention

Ce module contient des composantes sensibles aux decharges electro-statiques.

Valeur des signaux de sortie durant le démarrage, une remise à zéro et certaines pannes

Les sorties numériques des modules sont hors tension au cours du démarrage, à la suite d'une remise à zéro et au moment de certaines pannes. Ces valeurs par défaut sont sélectionnées à l'aide des interrupteurs situés sur la plaquette du module. La stratégie de contrôle doit être conçue de façon à éviter les blessures et les dommages matériels et à rétablir le fonctionnement normal du système de contrôle si le module tombe en panne.

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SECTION 1 - INTRODUCTION

OVERVIEW

The Quick Response Controller (IMQRC01) is an INFI 90 module that performs control schemes using digital and/or analog input data. The QRC contains on-board circuitry for four analog inputs, two analog outputs, three digital inputs and four digital outputs. The quick response controller communicates with other intelligent modules in the system over the module bus. The module bus provides a means to configure, tune, monitor and acquire data.

INTENDED USER

System engineers and technicians should read this manual before installing and operating the quick response controller. DO NOT operate the module until this instruction is read and understood. Refer to the table of contents or index to find specific information after the module is operating.

MODULE DESCRIPTION

The quick response controller is a user-configured device that executes sequential control schemes. This microprocessor based module resides in the INFI 90 system. The module can be configured to any control strategy desired using standard configuration tools and a defined library of function codes.

MODULE APPLICATION

Control schemes consist of function codes (from the INFI 90 function code library) that are stored in the on-board memory of the module. Besides executing control schemes, the module executes self-tests, security functions and bus interfacing.

INSTRUCTION CONTENT

This manual has eight sections and three appendices:

- | | |
|----------------------------------|---|
| Introduction | Is an overview of the features, specifications and a description of the QRC. |
| Description and Operation | Explains module operation, input and control circuitry, and configuration function codes. |
| Installation | Describes precautions to observe when handling modules and setup procedures required before module operation. This section discusses switch and jumper settings, and installation procedures. |

- Operating Procedures** Explains the front panel indicator and start-up of the QRC module.
- Troubleshooting** Describes the error indications and corrective actions to take.
- Maintenance** Contains a maintenance schedule for QRC modules.
- Repair/Replacement Procedures** Details the procedure to replace a QRC.
- Support Services** Provides replacement part ordering information. It explains other areas of support that Bailey Controls provides.
- Appendix A, B and C** Contain specific information necessary to connect a QRC to NTCS02/04 and NICS01 termination devices.

HOW TO USE THIS MANUAL

Read this manual through in sequence. It is important to become familiar with the entire contents of this manual before using the QRC. The manual is organized in sections to enable quick and easy access to specific information.

1. Read and do the steps in **Section 3**.
2. Refer to **Section 4** to evaluate operating indications.
3. Refer to **Section 5** if a problem occurs.
4. Refer to **Section 6** for scheduled maintenance requirements.
5. Use **Section 8** when ordering replacement parts.

NOMENCLATURE

Table 1-1 is a list of related hardware.

Table 1-1. Nomenclature

Nomenclature	Hardware
IMQRC01	Quick Response Controller Module
NICS01	Controller/Station Termination Module
NKTM01	Cable from NICS01 to IMQRC01
NKTU01	Cable from NTCS02/04 to IMQRC01
NKTU02	Cable from NICS01 to IMQRC01
NTCS02	Digital and Analog I/O Termination Unit
NTCS04	Digital and Analog I/O Termination Unit

REFERENCE DOCUMENTS

Table 1-2 lists the documents referenced in this instruction.

Table 1-2. Referenced Documents

Document Number	Document
I-E92-501-2	Configuration and Tuning Terminal Type CTT02 Manual
I-E93-900-20	Function Code Application Manual
I-E93-903	Configuration and Tuning Module (NCTM01) Manual
I-E93-903-2	Configuration Port Module (NCPM01) Manual
I-E96-409	Controller/Station Termination Module (NICS01) Manual
I-E96-442	Controller/Station Termination Unit (NTCS04) Manual
I-E96-423	Controller/Station Termination Unit (NTCS02) Manual

GLOSSARY OF TERMS AND ABBREVIATIONS

Table 1-3 lists definitions of the terms and abbreviations used in this instruction.

Table 1-3. Glossary of Terms and Abbreviations

Term	Definition
Checksum	A value computed from a data stream by treating each element as a number and computing a sum of the elements.
Configuration	The act of setting up equipment to accomplish specific functions or a list of parameters associated with such a setup.
CPM	Configuration Port Module. Communication link between the CTT and the module bus.
CTM	Configuration and Tuning Module. Provides a local means for system configuration, tuning and monitoring of intelligent masters over module bus.
CTT	Configuration and Tuning Terminal. A handheld module with the same functionality as the configuration and tuning module.
Dipshunt	A dual in-line package with shorting straps.
Dipswitch	A dual in-line package that contains switches.
EWS	Abbreviation for Engineering Work Station.
Fatal Error	An unexpected failure or error that prevents the module from executing the configuration.

GLOSSARY OF TERMS AND ABBREVIATIONS *(continued)*

Table 1-3. Glossary of Terms and Abbreviations (continued)

Term	Definition
Function Block	The occurrence of a function code at a block address of a module.
Function Code	An algorithm which defines specific functions. These functions are linked together to form the control strategy.
INFI-NET®	Advanced data communication highway.
LED	Light Emitting Diode.
LSB	Least Significant Bit. The bit of a binary number that carries the least numerical weight.
MFT	Machine Fault Timer. Reset by the processor during normal operation. If not reset regularly, the MFT times out and the module stops.
MMU	Module Mounting Unit. A card cage that provides electrical and communication support for INFI 90/Network 90® modules.
Module Bus	A serial communication link between a process control module and other process control modules.
MSB	Most Significant Bit. The bit of a binary number that carries the most numerical weight.
Node	A point of interconnection to a network.
Nonfatal Error	Any failure or error that does not prevent the module from executing the configuration.
NVRAM	Nonvolatile random access memory. Retains stored information when power is removed.
OIS	Operator Interface Station. Integrated operator console with data acquisition and reporting capabilities. It provides a digital access into the process for flexible control and monitoring.
PCU	Process Control Unit. A node on the plant-wide communication network that contains control and slave modules.
Plant Loop	Network 90 data communication highway.
RAM	Random Access Memory. Contents are lost when power removed.
ROM	Read Only Memory. Contents remain when power removed.
TM	Termination Module. Provides input/output connection between plant equipment and the INFI 90/Network 90 modules.
TU	Termination Unit. Provides input/output connection between plant equipment and the INFI 90/Network 90 modules.

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SPECIFICATIONS

Refer to Table 1-4 for specifications of the IMQRC01 Quick Response Controller module.

Table 1-4. Specifications

Physical Attribute/Function	Capabilities
Memory	
Random Access Memory (RAM)	4 kbytes
Read Only Memory (ROM)	32 kbytes
Nonvolatile Random Access Memory (NVRAM)	2 kbytes
Power Requirements	
Voltage	+5 VDC @ 750 mA (maximum) +15 VDC @ 89 mA (maximum) -15 VDC @ 74 mA (maximum) +24 VDC @ 50 mA (maximum)
Inputs	
4 Analog	1 to 5 VDC
3 Digital	24 VDC or 125 VDC
24 VDC Logic True	10.0 VDC (minimum), 5.5 mA
Logic False	1.7 VDC (maximum), 50 μ A
125 VDC Logic True	35.5 VDC (minimum), 5.3 mA
Logic False	5.6 VDC (maximum), 50 μ A
Input Crosstalk	-60 dB
Input Normal Mode Noise Rejection	-35 dB @ 60 Hz
Common Mode Noise Rejection	-46 dB @ 60 Hz
Common Mode Voltage	\pm 5 VDC (maximum)
Analog Input Impedance	>1 M Ω
Outputs	
2 Analog	1 to 5 VDC or 4 to 20 mA
Maximum loading	600 Ω (current output), > 250 k Ω (voltage output)
4 Digital	24 VDC @ 150 mA (isolated, open-collector type)
Maximum Inductive Load for Analog Outputs	600 mHz
Surge Protection	Meets ANSI/IEEE C37.90A-1974 guide for Surge Withstand Capability Test (previously IEEE 472-1974).
Execution Rates	Up to 12.5 times a second.

SPECIFICATIONS (continued)

Table 1-4. Specifications (continued)

Physical Attribute/Function	Capabilities
Control Variables	Internal resolution of 16 bit floating point numbers
Analog Input Resolution	12 bit
Analog Output Resolution	10 bit
Certification	CSA certified for use as process control equipment in an ordinary (nonhazardous) location. FM certified (up to 40° C) as nonincendive for use in Class I, Division 2, Groups A,B,C and D hazardous (classified) locations.
Environmental Ambient Temperature Relative Humidity Altitude Air Quality	0 to 70° C (32° to 158°F) 0% to 95% up to 55°C (131°F) (noncondensing) 0% to 45% at 70°C (158°F) (noncondensing) Sea Level to 3 km (1.86 miles) Noncorrosive
Mounting	Occupy one slot in a standard INFI 90 module mounting unit.

SECTION 2 - DESCRIPTION AND OPERATION

INTRODUCTION

This section explains the functions, module circuitry, data and connections for the Quick Response Controller (IMQRC01). It also details the function codes available to configure a QRC.

FUNCTIONAL OPERATION

The quick response controller consists of seven major sections. They are memory, module bus interface, machine fault timer, digital control station serial link, digital inputs/outputs, analog inputs/outputs, and the microprocessor, timing and control circuitry. See Figure 2-1.

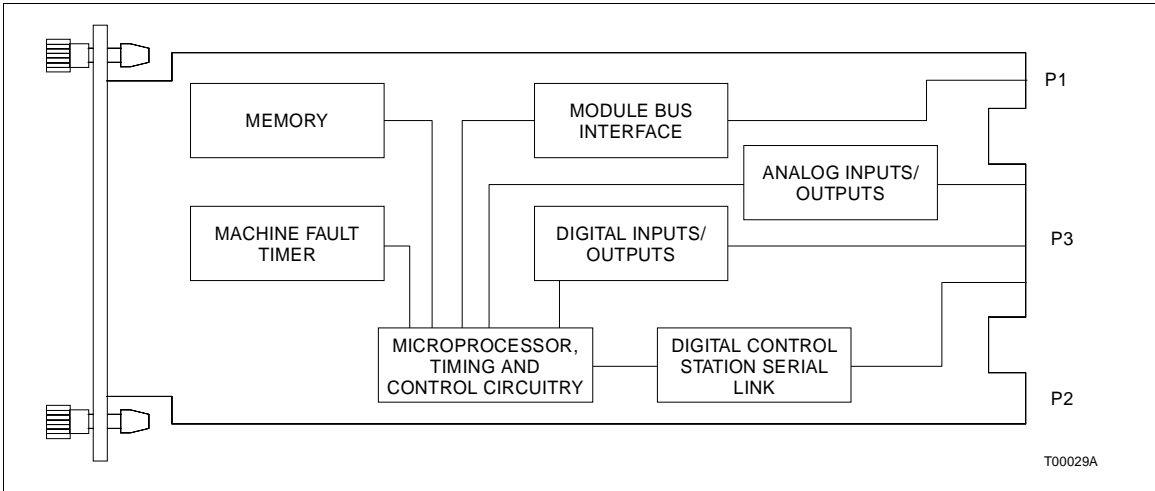


Figure 2-1. Quick Response Controller Block Diagram

Microprocessor, Timing and Control Circuitry

The quick response controller uses an eight bit microprocessor integrated circuit operating at two megahertz. This device controls memory, I/O circuitry and the machine fault timer (MFT). Additional circuitry provides the proper timing and clock signals to run the processor and other functions.

Module Bus Interface

The module bus interface on the quick response controller allows it to communicate with other INFI 90 modules in the same PCU. Every module on the module bus has a unique

address. The device address for the quick response controller is set via an eight position dipswitch.

NOTE: The QRC cannot communicate over the controlway.

Memory

The on-board memory is 32 kilobytes of read only memory (ROM), 4 kilobytes of random access memory (RAM) and 2 kilobytes of nonvolatile random access memory (NVRAM).

The ROM contains the function code library. The RAM serves two purposes: holds an operating copy of the configuration while the module is in the execute mode of operation; provides temporary storage for in-process algorithms. The NVRAM contains the permanent copy of the module configuration. The NVRAM of the quick response controller has the capacity for approximately 199 function blocks.

Machine Fault Timer

The machine fault timer (MFT) is a resettable one-shot timer that must be periodically set by the microprocessor. Several conditions detected by the microprocessor will keep it from setting the MFT. They are:

1. Trip block activated.
2. Excessive analog input gain/offset error.
3. Excessive analog output gain/offset error.
4. Power failure/reset during an NVRAM write.

If the MFT times out, the microprocessor halts. The QRC will not respond over the module bus, and the status LED changes to red. In addition, the digital outputs are de-energized and the analog outputs will either hold their last value or go to the power up preset value as selected during installation.

Digital Inputs/Outputs

There are three digital inputs and four digital outputs on-board. The inputs are jumper-selectable to be energized by 24 VDC or 125 VDC. The inputs are optically-isolated; outputs are isolated, open-collector type. The I/O signals are routed to the NTCS02/04 termination unit through the NKTU01 cable or to the NICS01 termination module through the NKTU02 or NKTU01 cable.

Analog Inputs/Outputs

There are four analog inputs and two analog outputs on-board. The inputs must be 1 to 5 VDC analog signals. The outputs are dipswitch selectable to be either a voltage signal (1 to 5 VDC) or a current signal (4 to 20 milliamps). The I/O signals are routed through the same termination unit and cable as the digital I/O signals.

Digital Control Station Serial Link

Communication between the QRC and a digital or analog control station is via a five kilobaud, RS-422 serial link. A maximum of four stations can be daisy chained on the serial link.

SECURITY FUNCTIONS

Two types of security functions are performed: module security and control input security. Module security is provided by a machine fault timer (MFT) that is periodically reset by the microprocessor. If the timer is not reset, it:

- Shuts the module down.
- Turns the front panel status LED red.
- Causes the analog outputs to either hold, go to 0 percent, or go to 100 percent (user-selectable).
- De-energizes the digital outputs.
- Prevents writing to or erasing the NVRAM.

Control input security is provided by adding function code 31 (test quality) to the configuration. This function tests the quality of a maximum of four inputs. If the inputs are good, the output of the test quality block is set to Logic 0. If any of the inputs are bad, the output of the block is set to Logic 1. Depending on the importance of the input, the block output can cause transfer of control to a manual/auto station, shut down the process or send a warning to the user.

Additionally, on-line tests are performed to verify proper hardware operation. If any of these tests fail, the timer is not reset and status LED turns red. If an NVRAM checksum error is detected, the module continues operating; however, the status LED flashes green. After resetting the module, it will enter the error mode.

CONFIGURATION

A configuration must be defined to determine the operations a QRC performs on its input signals. This section explains the function codes that can be used with a QRC. Function codes are software algorithms that can be configured to execute specific tasks. A function block in memory has a reference number (block address) that can be used as an input reference by other function blocks. The QRC processes defined function blocks in ascending order.

NOTE: This instruction contains the function codes available to the IMQRC01. The function codes defined in this section reflect the function codes that were available at the time the instruction was created. Refer to the latest *Function Code Application Manual* for additional function codes.

Function Blocks

NOTE: Refer to the *Function Code Application Manual* for the specifications and outputs of the QRC function codes.

The range of function blocks for the quick response controller is 0 through 240. Blocks 0 through 9 are reserved for analog and logic constants. Blocks 200 through 240 are reserved for the executive block and outputs of all the fixed address system blocks. The executive block handles overall module operation. The fixed address system block outputs can be used anywhere in the configuration. Blocks 10 through 199 are user-assignable. Table 2-1 lists the outputs of the executive block and the fixed address system blocks.

Table 2-1. Function Block Outputs

Block Number	Outputs	Block Number	Outputs
0	Logic 0	202	Analog Input 2
1	Logic 1	203	Analog Input 3
2	Reserved	204	Analog Input 4
3	-100.0	211	Analog Output 1
4	-1.0	212	Analog Output 2
5	0.0	221	Digital Input 1
6	1.0	222	Digital Input 2
7	100.0	223	Digital Input 3
8	-9.2 E -18 (Max. Neg. Value)	231	Digital Output 1
9	9.2 E 18 (Max. Pos. Value)	232	Digital Output 2
10 through 199	User Assignable	233	Digital Output 3
200	Reserved	234	Digital Output 4
201	Analog Input 1	240	Executive Block

Function Codes

The control strategy is designed with function codes from the INFI 90 function code library residing in ROM. Each code has a set of specifications with default values. The specifications can be changed to meet the requirements of your application. Table 2-2 lists the available function codes. The block numbers column (in Table 2-2) is the range of user-assignable block numbers.

Table 2-2. Function Codes

Function Code	Description	Block Numbers
1	Function Generator	10 - 199
2	Manual Set Constant	10 - 199
3	Lead/Lag	10 - 199
4	Pulse Positioner	10 - 199
5	Pulse Rate	10 - 199
6	High/Low Limiter	10 - 199
7	Square Root	10 - 199
8	Rate Limiter	10 - 199
9	Analog Transfer	10 - 199
10	High Select	10 - 199
11	Low Select	10 - 199
12	High/Low Compare	10 - 199
13	Integer Transfer	10 - 199
14	Sum-4 Inputs	10 - 199
15	Sum-2 Inputs with Gain	10 - 199
16	Multiply	10 - 199
17	Divide	10 - 199
18	PID Error Input	10 - 199
19	PID (PV and SP)	10 - 199
20	Indicator Station	10 - 199
21	M/A Station (Basic)	10 - 199
22	M/A Station (Cascade)	10 - 199
23	M/A Station (Ratio)	10 - 199
24	Adapt	10 - 199
25	Analog Input/Module Bus	10 - 199
26	Analog Input/Plant Loop	10 - 199
27	Analog Input	10 - 199
28	Analog Output/Bus (Same PCU)	10 - 199
29	Analog Output	10 - 199
30	Analog Output/Plant Loop	10 - 199
31	Test Quality	10 - 199
32	Trip	10 - 199
33	Not	10 - 199
34	Memory (Set, Reset)	10 - 199
35	Time Delay	10 - 199
36	Qualified OR - 8 Input	10 - 199
37	AND - 2 Input	10 - 199
38	AND - 4 Input	10 - 199
39	OR - 2 Input	10 - 199
40	OR - 4 Input	10 - 199

Table 2-2. Function Codes (continued)

Function Code	Description	Block Numbers
41	Digital Input/Module Bus	10 - 199
42	Digital Input/Plant Loop	10 - 199
43	TCS Digital Input	10 - 199
44	TCS Digital Output	10 - 199
45	Digital Output/Plant Loop	10 - 199
50	Manual Set Switch	10 - 199
51	Manual Set Constant (Nontunable)	10 - 199
52	Manual Set Integer	10 - 199
53	Executive Block (COM)	240
58	Time Delay (Analog)	10 - 199
59	Transfer, Digital	10 - 199
62	Remote Control Memory	10 - 199
63	Analog Input List (Module Bus)	10 - 199
64	Digital Input List (8)/Module Bus	10 - 199
65	Digital Sum - 4 Input	10 - 199
66	Analog Trend	10 - 199
68	Remote Manual Set Constant	10 - 199
69	Test Alarm	10 - 199
85	Up/Down Counter	10 - 199
86	Elapsed Timer	10 - 199
95	Logic Station Interface	10 - 199
101	Exclusive OR	10 - 199

SECTION 3 - INSTALLATION

INTRODUCTION

This section explains what must be done before placing the Quick Response Controller (IMQRC01) into operation. Read, understand and do the steps in the order they appear before operating the QRC.

SPECIAL HANDLING

NOTE: Always use Bailey's Field Static Kit (P/N 1948385A1 - consists of wrist strap, ground cord assembly, alligator clip, static dissipative work surface) when working with modules. The kit is designed to connect a technician and the static dissipative work surface to the same ground point to prevent damage to the modules by electrostatic discharge.

The QRC uses electrostatic sensitive devices. Follow Steps 1 through 4 when handling:

1. Keep the module in its special antistatic bag until actual installation takes place. Save the bag for future use.
2. Ground the antistatic bag before opening.
3. Verify that all devices connected to the module are properly grounded before using them.
4. Avoid touching the circuitry when handling the module.

UNPACKING AND INSPECTION

1. Examine the hardware immediately to verify it has not been damaged in transit.
2. Notify the nearest Bailey Controls sales office of any such damage.
3. file a claim for any damage with the transportation company that handled the shipment.
4. Use the original packing material and container to store the hardware.
5. Store the hardware in an environment of good air quality, free from temperature and moisture extremes.

SETUP/PHYSICAL INSTALLATION

This section explains the procedures to set switches and jumpers, and install the QRC. After installing this module, a configuration must be created to define the functions a QRC will perform.

NOTE: The installation section provides instructions pertaining to the installation of the QRC only. For complete TU/TM installation, wiring and cable information, refer to the termination unit/module manual.

Quick Response Controller Installation

The following steps must be performed to install the IMQRC01.

1. Setting the output type and default value for analog output number 1 (switch S2).
2. Setting the output type and default value for analog output number 2 (switch S3).
3. Setting the module address, configuration lock status, and hardware operating mode on switch S4.
4. Setting digital input jumpers J1, J2 and J3 for the type of digital input.
5. Connecting cables.
6. Installing the module.

Figure 3-1 shows the location of switch S2, S3 and S4 and edge connectors.

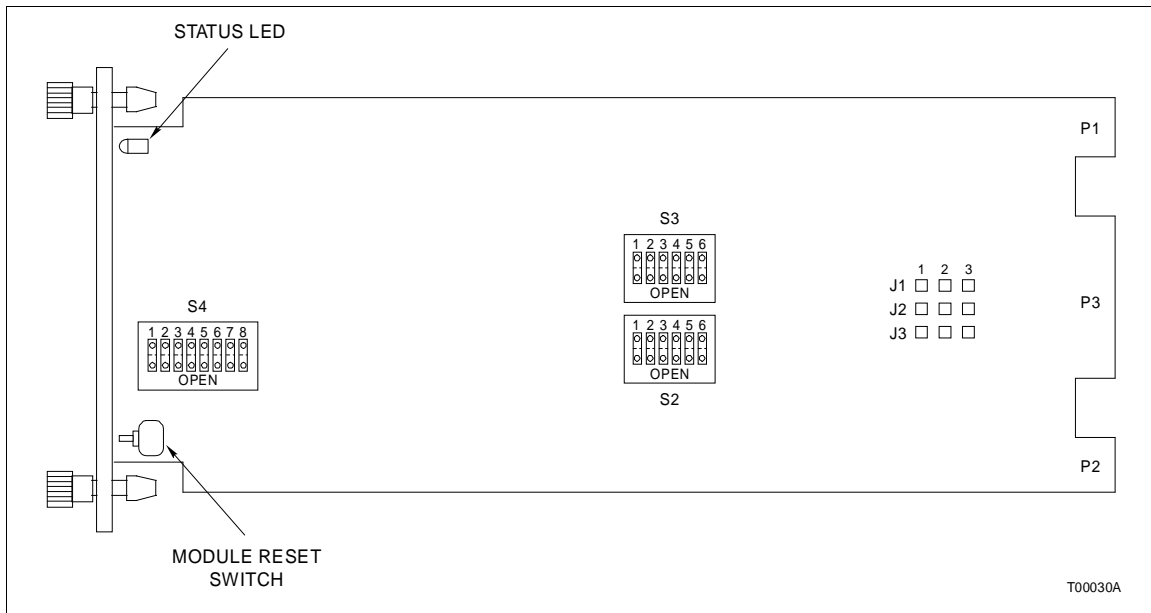


Figure 3-1. Quick Response Controller

SWITCH S2 AND S3 SETTINGS

Switches S2 and S3 set the analog output type and default value (the value of the output during power up, reset and certain failure conditions) for analog output number 1 and 2 respectively. Figure 3-1 shows the location of S2 and S3. Table 3-1 shows the selectable options and the corresponding dipswitch settings. Each dipswitch position (position 1) or group of positions (positions 2, 3 and 4 through 6) functions independently of each other. Please note that the dipswitch settings in Table 3-1 apply to both S2 and S3.

WARNING	The control system must be carefully evaluated to establish default values that will prevent personal injury and/or property damage in the case of module failure.
AVERTISSEMENT	Il faut soigneusement évaluer le système de commande afin d'établir des valeurs par défaut qui permettront d'éviter des blessures et des dommages matériels en cas de défaillance des modules.

CAUTION	Do not set switch S2 and S3 to any configuration other than those specified in Table 3-1. Damage to the circuit board may result.
ATTENTION	Le réglage des interrupteurs S2 et S3 doit correspondre à l'un des choix figurant au Tableau 3-1. Sinon, la carte de circuits imprimés pourrait être endommagée.

Table 3-1. Switch S2 and S3 Settings

Position	Setting	Function	User Setting
1	1 0	5.25 VDC analog output during power up. 0.75 VDC analog output during power up.	
2 3	1 0 0 1	Holds last analog output value on timeout. Goes to power up value set by S2-1 on timeout.	
4 5 6	0 1 0 1 0 1	Yields voltage output (1 to 5 VDC). Yields current output (4 to 20 mADC).	

NOTE: 1=OPEN (OFF); 0=CLOSED (ON)

SWITCH S4 SETTINGS

Switch S4 sets the QRC operating states (normal mode or diagnostic mode), initialization status, configuration lock status, diagnostic mode test and module address of the QRC. Figure 3-1 shows the location of S4. Figure 3-2 shows the S4 dipswitch positions and their uses. Table 3-2 shows the available S4 settings. When setting the module address, refer to Table 3-3 for the corresponding dipswitch positions.

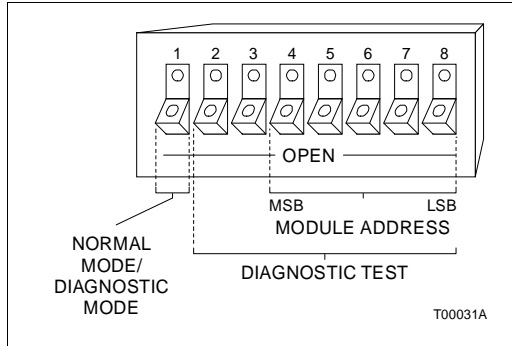


Figure 3-2. Switch S4

NOTE: For INFI 90 dipswitches, OPEN or OFF have the same meaning.

Table 3-2. Switch S4 Settings

Description	Switch Position							
	1	2	3	4	5	6	7	8
Normal Mode								
Normal Operation	0	0	0	0	0	0	0	0
NVRAM Initialization	0	1	0	0	0	0	0	0
Configuration Lockout	0	0	1	0	0	0	0	0
Diagnostic Mode								
Group Test	1	0	0	0	0	0	0	0
Switch/LED Test	1	0	0	0	0	0	0	1
ROM2 Test	1	0	0	0	0	0	1	0
ROM1 Test	1	0	0	0	0	0	1	1
RAM Test	1	0	0	0	0	1	0	0
Clock Test	1	0	0	0	0	1	0	1
Hardware Time Test	1	0	0	0	0	1	1	0
Analog Output Test ¹	1	0	0	0	0	1	1	1

Table 3-2. Switch S4 Settings (continued)

Description	Switch Position							
	1	2	3	4	5	6	7	8
Diagnostic Mode								
Digital Output Test ¹	1	0	0	0	1	0	0	0
Machine Fault Timer (MFT) Test	1	0	0	0	1	0	0	1

NOTES:

1=OPEN (OFF); 0=CLOSED (ON);

1. Never perform this test while QRC is connected to ANY final element. Analog outputs produce sawtooth waveforms that ramp from 0 to 100% and back to 0 percent. Digital outputs cycle ON and OFF continuously.

Table 3-3. Module Address Settings (S4)

Address	MSB					LSB					Address	MSB					LSB				
	4	5	6	7	8	4	5	6	7	8		4	5	6	7	8	4	5	6	7	8
0 ¹	0	0	0	0	0	0	0	0	0	0	16	1	0	0	0	0	0	0	0	0	0
1 ¹	0	0	0	0	0	1	0	0	0	0	17	1	0	0	0	0	1	0	0	0	1
2	0	0	0	1	0	0	0	0	1	0	18	1	0	0	1	0	0	0	1	0	0
3	0	0	0	1	1	0	0	0	1	1	19	1	0	0	1	1	0	0	1	1	0
4	0	0	1	0	0	0	0	0	0	0	20	1	0	1	0	0	0	0	0	0	0
5	0	0	1	0	1	0	0	0	1	1	21	1	0	1	0	1	0	0	1	0	1
6	0	0	1	1	0	0	0	0	1	0	22	1	0	1	1	0	0	0	1	0	1
7	0	0	1	1	1	0	0	0	1	1	23	1	0	1	1	1	0	0	1	0	1
8	0	1	0	0	0	0	0	0	0	0	24	1	1	0	0	0	0	0	0	0	0
9	0	1	0	0	1	0	0	0	0	0	25	1	1	0	0	1	0	0	0	0	1
10	0	1	0	1	0	0	0	0	0	0	26	1	1	0	1	0	0	0	0	0	1
11	0	1	0	1	1	0	0	0	0	0	27	1	1	0	1	1	0	0	0	0	1
12	0	1	1	0	0	0	0	0	0	0	28	1	1	1	0	0	0	0	0	0	1
13	0	1	1	0	1	0	0	0	0	0	29	1	1	1	0	1	0	0	0	0	1
14	0	1	1	1	0	0	0	0	0	0	30	1	1	1	1	0	0	0	0	0	1
15	0	1	1	1	1	0	0	0	0	0	31 ¹	1	1	1	1	1	0	0	0	0	1

NOTES: 1= OPEN (OFF); 0=CLOSED (ON);

1. Reserved.

The normal modes are:

Normal Operation

The QRC operates normally (control strategies can be configured, run and monitored).

Initialize NVRAM

Initialize NVRAM is set to clear any existing configuration from nonvolatile random access memory (NVRAM). This initializes the NVRAM prior to entering a configuration, and should be done before loading a new configuration. The QRC status LED will blink green to indicate that initialization is complete.

Configuration Lockout Configuration lockout allows normal operation but prevents access to the configuration. This should be used if a configuration change could cause injury or significant equipment damage.

The diagnostic modes are designed as troubleshooting aides to assist in problem detection. When performing any of these tests, wait approximately 30 seconds, then check the status LED. A green LED indicates the test was successful and a red LED indicates failure of the test.

NOTE: The address must be a unique address within a PCU. Normally, addresses 0, 1 and 31 are not used for a QRC because they are reserved for communication modules (address 0 and 1) and CTM or CTTs (address 31).

DIGITAL INPUT JUMPER SETTINGS

There are three on-board jumpers (J1 through J3) that select the type of digital input signals (24 VDC or 125 VDC) being monitored. Jumper J1 controls digital input number 1, J2 controls digital input number 2, and J3 controls digital input number 3.

1. Jumper pins 2 and 3 together to monitor 125 VDC signals.
2. Jumper pins 1 and 2 together to monitor 24 VDC signals.

Each input can be configured independently of the other. Refer to Figure 3-1 for jumper locations.

PHYSICAL INSTALLATION

The QRC inserts into a standard INFI 90 module mounting unit (MMU) and occupies one slot. To install:

NOTE: Ensure all jumpers and switches are configured prior to installing.

1. Verify the slot assignment of the module.
2. Connect the hooded end of a termination cable (NKTU01, NKTU02 or NKTM01) to the MMU backplane. To do this, insert the connector into the backplane slot of the same slot assigned to the QRC. The latches should snap securely into place.
3. Align the module with the guide rails in the MMU; slide the module into the MMU until the front panel is flush with the top and bottom of the MMU frame.

4. Push and turn the two captive retaining screws on the module faceplate one half turn to the latched position. It is latched when the slots on the screws are vertical and the open ends face the center of the module. (To remove the module, turn the module retaining screws to the unlatched position and slide it out).

Termination Unit

The termination unit/module is the interface between process I/O and the module. The termination units/modules used with the QRC are the NTCS02, NTCS04 and NICS01.

SECTION 4 - OPERATING PROCEDURES

INTRODUCTION

This section explains the modes of operation, front panel indicators and start-up procedures for the Quick Response Controller (IMQRC01).

MODES OF OPERATION

The QRC has three modes of operation: EXECUTE, CONFIGURE and ERROR mode. The mode can be changed using an operator interface. Operator interfaces include the configuration and tuning module (CTM), configuration and tuning terminal (CTT), operator interface station (OIS), management command system (MCS) or engineering work station (EWS). Descriptions of the three modes follow.

Configure Mode

The configure mode is used to enter or update the control strategy.

Execute Mode

The execute mode is the normal mode of operation. In this mode, the module executes the control strategy, updates the outputs and communicates over the module bus and slave expander bus.

Error Mode

The error mode occurs when a hardware or software error is detected (refer to the troubleshooting section for corrective action).

STATUS LED

The QRC has a single status LED indicator. The status LED has three states: green, flashing green and red. Green means that the module is operating properly, executing control strategies, updating outputs, etc. Flashing green means that the module has been put in the configure mode or that a nonfatal error situation exists. Red means that a fatal error has occurred (again, refer to the troubleshooting section for corrective action). Figure 4-1 shows the location of the status LED.

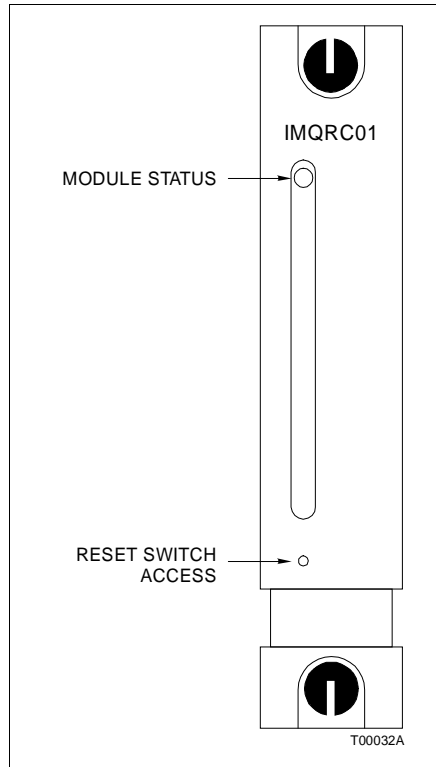


Figure 4-1. QRC Front Panel

RESET SWITCH

The reset switch is used to reset the module. Press the switch once when the module is in the execute mode and the outputs will return to their default state. If the status LED is flashing green when the module is in the execute mode and the reset switch is pressed, the module will enter the error mode. At this point, any of the INFI 90 interface units can be used to check the module to find the cause of the error.

CONFIGURATION

Once the QRC is installed, a configuration must be defined to determine the operations a QRC performs on its input signals. The description and operation section lists the function codes available to configure a Quick Response Controller (IMQRC01).

For an explanation of these function codes and their specifications, or an explanation of function blocks and configurations, refer to the ***Function Code Application Manual***.

NOTE: The NVRAM should be initialized BEFORE entering a configuration into the module. This can be done using the operator interface console (OIC), engineering work station (EWS), or switch S4.

To enter a function block configuration into memory, the module must be in configure mode. After entering all values, change the mode to execute. If any errors exist in the configuration, the module will not go into execute. Instead, the status LED will continue to blink green and the operator interface will indicate error mode. The cause of the configuration error can be determined by reading status information from the QRC. Refer to the product instruction for the operator interface console being used for procedures to change mode, configure a module and view status messages. Please note that the configuration lockout dipswitch (S4-3) should be set to OPEN (OFF) to prevent unauthorized access to the configuration.

START-UP PROCEDURES

After the quick response controller has been prepared (i.e., defaults set, address set, input jumpers set), installed, and configured, it is ready to be used. Using one of the INFI 90 interface units, put the module into the execute mode. The status LED should be green. This means that the configuration has valid parameters, and the module is performing as it should. If the status LED is flashing green or red, refer to the troubleshooting section for corrective action.

SECTION 5 - TROUBLESHOOTING

INTRODUCTION

This section explains the error indications and corrective actions for the Quick Response Controller (IMQRC01).

ERROR INDICATIONS AND CORRECTIVE ACTION

The status of the QRC can be obtained through an operator interface or the front panel LED. An operator interface can also be used to verify the input values received by the QRC from other modules and on-board inputs.

QUICK RESPONSE CONTROLLER STATUS INDICATOR

The QRC has a single status LED. The status LED shows either normal operating conditions or error conditions. Table 5-1 summarizes the LED states, probable causes and corrective actions to take for the different indications. LED states that indicate an error condition are:

Red A red LED indicates a fatal error has occurred. With this type of error, the module halts all operation and does not communicate over the module bus. Without communication over the module bus, the module status bytes cannot be accessed. The module should be replaced with a configured backup.

Table 5-1. QRC Status LED States and Corrective Actions

LED State	Indication	Probable Cause	Corrective Action
Green	Module in EXECUTE mode. No errors exist.	Normal operation.	No corrective action required.
Blinking Green	Module in CONFIGURE mode.	Normal operation.	Use configuration tool to enter the control strategy.
	Module in EXECUTE mode.	A nonfatal error such as self-test routine failure has occurred.	Push the Reset pushbutton. The module is now in ERROR mode. Use configuration tool to obtain the status word indicating the error. Refer to Table 5-2.
Red	Module in ERROR mode. QRC does not communicate with modules on module bus. Status bytes cannot be read.	A fatal error has occurred.	Replace module or contact nearest Bailey Controls representative.
Off	No power to QRC.	Microprocessor or related hardware failure.	Replace module or contact nearest Bailey Controls representative.

Blinking Green The LED blinking green indicates that the module has detected an error in configuration when attempting to go from configure to execute mode. The module status bytes can be monitored to identify the configuration error. Refer to Table 5-2.

MODULE STATUS BYTES

The QRC module status bytes provide information concerning the QRC inputs. The module status bytes are displayed as hexadecimal values on the CTT or CTM by entering the module address and successively pressing **NEXT**. On the OIS, MCS or EWS, the status bytes can be accessed by displaying the module status screen. Table 5-2 interprets the bits presented in the module status bytes.

Table 5-2. Module Status Bytes

Byte	Bit							
	7	6	5	4	3	2	1	0
1	ES	MODE		TYPE=7				
2	FTX		RIO	LIO	SEG	NVF	NVI	DSS
3	Bytes 3 to 5 combine to define other errors.							
4	Bytes 3 to 5 combine to define other errors.							
5	Bytes 3 to 5 combine to define other errors.							

Table 5-2. Module Status Bytes

Field	Value			Description
Byte 1				
ES	80			Error Summary (0=OK, 1=ERRORS)
MODE	60			Module Mode (00=CFG, 10=ERR, 11=EXT)
TYPE	1F			Module Type Code =(5) ¹⁶
Byte 2				
FTX	80			First Time in Execute (0=NO, 1=YES)
RIO	20			Summary Remote Input Status (0=OK, 1=BAD)
LIO	10			Summary Local Input Status (0=OK, 1=BAD)
SEG	08			Summary Segment Alarm Status (0=OK, 1=BAD)
NVF	04			Nonvolatile Memory Failure (0=NO, 1=YES)
NVI	02			Nonvolatile Memory Initialized (0=NO, 1=YES)
DSS	01			Digital Station Status (0=OK, 1=BAD)
Bytes 3 - 5	3	4	5	
	01	01	-	NVRAM Error: Write Failure Checksum Failure Bad Data Reset During Write
		02	-	
		03	-	
		FF	-	
	02	00	04	AI Reference Error: 1 Volt Reference
			05	AI Reference Error: 5 Volt Reference
	03	00	-	Missing I/O Expansion Board

Table 5-2. Module Status Bytes (continued)

Field	Value			Description
Bytes 3 - 5	3	4	5	Configuration Error - Undefined Block (1) = Block Making Reference (2) = Block Being Referenced
	05	(1)	(2)	
	06	(1)	(2)	
	08	(1)	-	
				Trip Block Activated (1) = Block Number of TRIP Block

NOTE: All numbers in bytes 4 and 5 are encoded in hexadecimal.

CONNECTOR PINOUTS

Tables 5-3 and 5-4 show the pinouts for the QRC edge connectors.

Table 5-3. P1 Pinout

Pin	Signal	Pin	Signal
1	+5 VDC	2	+5 VDC
3	NC	4	NC
5	Common	6	Common
7	+15 VDC	8	-15 VDC
9	PFI	10	PFI
11	Module Bus	12	Module Bus

NOTE: PFI = Power Fail Interrupt, NC = Not Connected

Table 5-4. P3 Pinout

Pin	Signal	Pin	Signal
1	Digital Output 1-	A	Digital Output 1+
2	Digital Output 2-	B	Digital Output 2+
3	Digital Output 3-	C	Digital Output 3+
4	Digital Output 4-	D	Digital Output 4+
5	Serial Link-	E	Serial Link+
6	Digital Input 1-	F	Digital Input 1+
7	Digital Input 2-	H	Digital Input 2+
8	Digital Input 3-	J	Digital Input 3+
9	+24 VDC	K	NC
10	Analog Output 1-	L	Analog Output 1+
11	Analog Output 2-	M	Analog Output 2+
12	Analog Input 1-	N	Analog Input 1+
13	Analog Input 2-	P	Analog Input 2+
14	Analog Input 3-	R	Analog Input 3+
15	Analog Input 4-	S	Analog Input 4+

NOTE: PFI = Power Fail Interrupt, NC = Not Connected

SECTION 6 - MAINTENANCE

INTRODUCTION

The Quick Response Controller (IMQRC01) requires limited maintenance. This section contains a maintenance schedule.

MAINTENANCE SCHEDULE

Perform the tasks in Table 6-1 at the specified intervals.

Table 6-1. Maintenance Schedule

Task	Interval
Clean and tighten all power, I/O and grounding connections.	Every six months or during plant shutdown, whichever occurs first.
Use a static safe vacuum cleaner to remove dust from: Modules Module Mounting Unit Fan Assembly Power Entry Panel Termination Units/Modules	Every six months or during plant shutdown, whichever occurs first.

SECTION 7 - REPAIR/REPLACEMENT PROCEDURES

INTRODUCTION

This section explains the replacement procedures for a Quick Response Controller (IMQRC01). There are no special tools required to replace these modules.

MODULE REPAIR/REPLACEMENT PROCEDURES

If a QRC is faulty, replace it with a new one. DO NOT try to repair the module. Replacing components may affect the module performance and certification.

The module can be removed while system power is supplied. To replace a module:

WARNING

If the module is located in a Class I Division 2 hazardous environment, take the necessary precautions before and during module replacement. Fire or explosion may result.

AVERTISSEMENT

Si le module est situé dans un environnement dangereux de Classe 1, Division 2, prenez les précautions nécessaires avant et pendant son remplacement. Il existe un risque d'incendie et d'explosion.

1. Push and turn the two front panel captive retaining screws one half turn to unlatch the module. It is unlatched when the slots on the screws are vertical and the open end of the slots face away from the module.
2. Slide the module out of the MMU.
3. Configure the replacement module switches and jumper settings. Ensure they are the same as the original module.
4. In the same slot assignment as the original module, align the replacement module with the guide rails in the MMU; slide it in until the front panel is flush with the top and bottom of the MMU frame.
5. Push and turn the two captive retaining screws on the module faceplate one half turn to the latched position. It is latched when the slots on the screws are vertical and the open ends face the center of the module.
6. Configure the replacement module default settings and control strategy. Ensure they are the same as the original module.

7. Return to normal operation.

SECTION 8 - SUPPORT SERVICES

INTRODUCTION

Bailey Controls is ready to help in the use, application and repair of its products. Contact the nearest sales office to make requests for sales, applications, installation, repair, overhaul and maintenance contract services.

REPLACEMENT PARTS AND ORDERING INFORMATION

When making repairs, order replacement parts from a Bailey Controls sales office. Provide this information:

1. Part description, part number and quantity.
2. Model and serial numbers (if applicable).
3. Bailey Controls instruction manual number, page number and reference figure that identifies the part.

Order parts without commercial descriptions from the nearest Bailey Controls sales office.

Table 8-1. Spare Parts List

Description	Part No.
Jumper	1946984A1

TRAINING

Bailey Controls has a modern training facility that provides service and repair instruction. This facility is available for in-plant training of your personnel. Contact a Bailey Controls sales office for specific information and scheduling.

TECHNICAL DOCUMENTATION

Additional copies of this manual, or other Bailey Controls manuals, can be obtained from the nearest Bailey Controls sales office at a reasonable charge.

APPENDIX A - TERMINATION UNIT CONFIGURATION (NTCS02)

INTRODUCTION

The NTCS02 Termination Unit and NKTU01 cable interface field inputs and outputs to the QRC. The termination unit must be configured for the types of inputs and outputs desired using dipshunts. Tables A-1 through A-3 show the possible dipshunt configurations. Figure A-1 shows the TCS terminal assignments.

Table A-1. Analog Input Type

Analog Input	
Application/Signal Type	Dipshunt Configuration XU1 - XU4
System Powered 4-20 mA	
Externally Powered 4-20 mA	
Single Ended Voltage	
Differential Voltage	

T00033A

Table A-2. Digital Input

Digital Input	
Application/Signal Type	Dipshunt Configuration XU5 - XU7
System Powered E3/E4	
Field Powered ¹	<p style="text-align: right;">T00034A</p>

NOTE: 1. Using the field device to complete the path to ground is commonly referred to as **switching neutral**. Using the field device to complete the path to the slave is referred to as **switching hot**. If **switching hot** is the desired method, the field powered dipshunt configuration must be used. If system power is required, it should be wired as a field source. See Figure A-2 for an example of **switching hot** and **switching neutral**.

Table A-3. Analog Output Type

Analog Input	
Application/Signal Type	Dipshunt Configuration XU9
Both Outputs in Voltage Mode	
Output 1 in Voltage Mode, Output 2 in Current Mode	
Output 1 in Current Mode, Output 2 in Voltage Mode	
Both Outputs in Current Mode (No Dipshunt Required)	<p style="text-align: right;">T00035A</p>

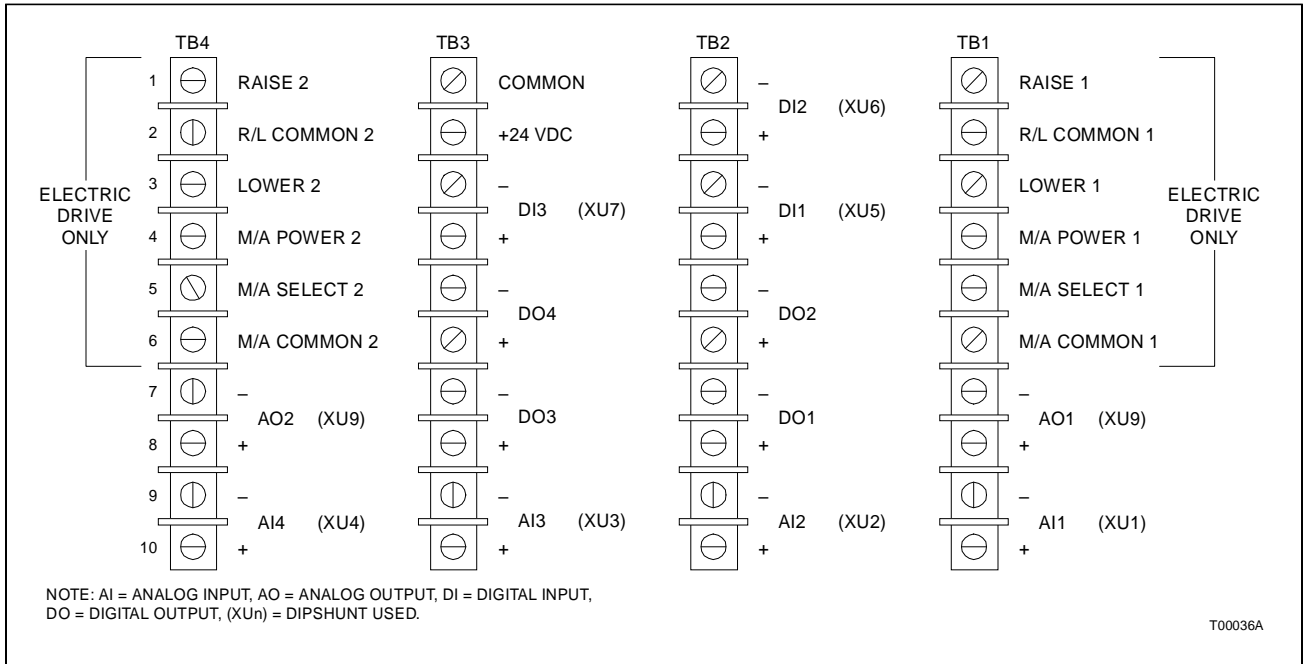


Figure A-1. NTCS02 Terminal Assignments

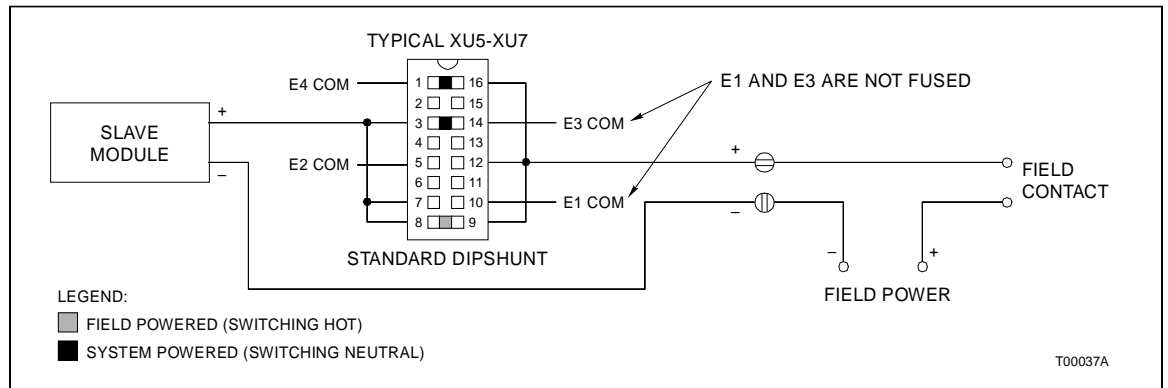


Figure A-2. Switching Hot vs. Switching Neutral Example

APPENDIX B - TERMINATION UNIT CONFIGURATION (NTCS04)

INTRODUCTION

The NTCS04 Termination Unit and NKTU01 cable interface field inputs and outputs to the QRC. The termination unit must be configured for the types of inputs and outputs required using dipshunts. Tables B-1 through B-3 show the possible dipshunt configurations. Figure B-1 shows the TCS terminal assignments.

Table B-1. Analog Input Type

Analog Input	
Application/Signal Type	Dipshunt Configuration XU1 - XU4
System Powered 4-20 mA	
Externally Powered 4-20 mA	
Single Ended Voltage	
Differential Voltage	

T00033A

Table B-2. Digital Input

Digital Input	
Application/Signal Type	Dipshunt Configuration XU5 - XU7
System Powered E3/E4	
Field Powered ¹	<p style="text-align: right; font-size: small;">T00034A</p>

NOTE: 1. Using the field device to complete the path to ground is commonly referred to as **switching neutral**. Using the field device to complete the path to the slave is referred to as **switching hot**. If **switching hot** is the desired method, the field powered dipshunt configuration must be used. If system power is required, it should be wired as a field source. See Figure B-2 for an example of **switching hot** and **switching neutral**.

Table B-3. Analog Output Type

Analog Input	
Application/Signal Type	Dipshunt Configuration XU9
Both Outputs in Voltage Mode	
Output 1 in Voltage Mode, Output 2 in Current Mode	
Output 1 in Current Mode, Output 2 in Voltage Mode	
Both Outputs in Current Mode (No Dipshunt Required)	<p style="text-align: right; font-size: small;">T00035A</p>

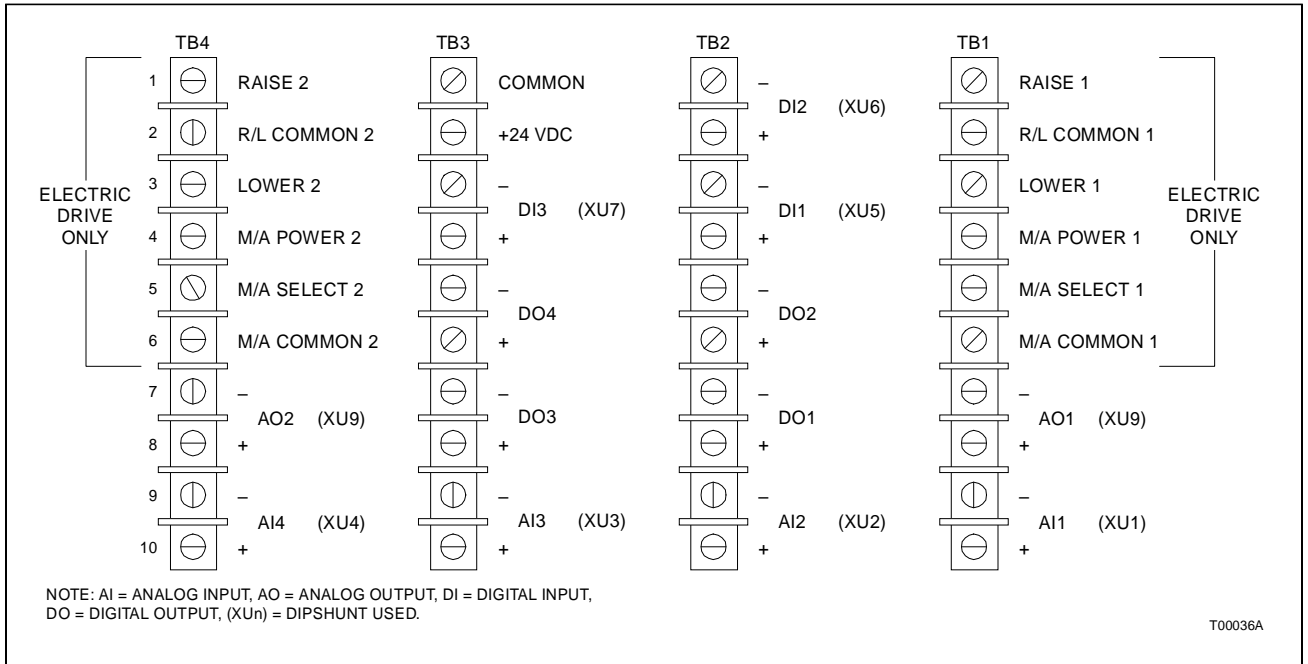


Figure B-1. NTCS02 Terminal Assignments

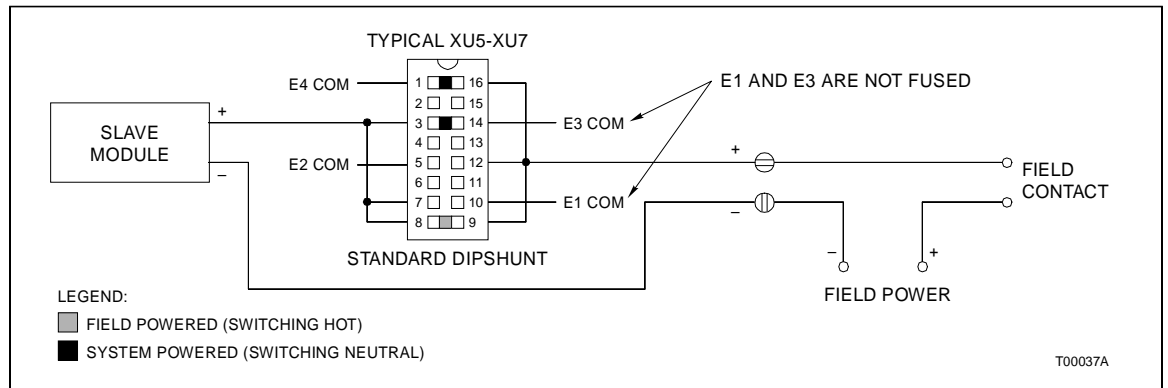


Figure B-2. Switching Hot vs. Switching Neutral Example

APPENDIX C - TERMINATION MODULE CONFIGURATION (NICS01)

INTRODUCTION

The NICS01 termination module and NKTU02 cable interface field inputs and outputs to the QRC. The termination module must be configured for the types of inputs and outputs desired using dipswitches. Table C-1 and C-2 show the possible dipswitch settings. Figure C-1 shows the ICS terminal assignments.

Table C-1. Switch S1, S2, S3 and S4 Settings

Analog Input Signal Type	Switch Position							
	1	2	3	4	5	6	7	8
System Powered (1-5 VDC)	1	1	1	1	1	1	0	0
Externally Powered (4-20 mA)	0	0	0	0	1	1	1	1
Single Ended Voltage (1-5 VDC)	0	0	0	1	0	1	1	1
Differential Voltage (1-5 VDC)	0	0	0	0	0	0	1	1

NOTE: 0=OPEN (OFF); 1=CLOSED (ON)

Table C-2. Switch S5 Settings

Analog Output Signal Type	Switch Position ¹			
	1	2	3	4
Both outputs are 1-5 VDC	1	1	1	1
Analog Output 1 is 1-5 VDC, Analog Output 2 is 4-20 mA	1	1	0	0
Analog Output 1 is 4-20 mA, Analog Output 2 is 1-5 VDC	0	0	1	1
Both outputs are 4-20 mA	0	0	0	0

NOTE: 0=OPEN (OFF); 1=CLOSED (ON);

1. Switch positions 1 and 2 represent Analog Output 1 and Switch positions 3 and 4 represent Analog Output 2.

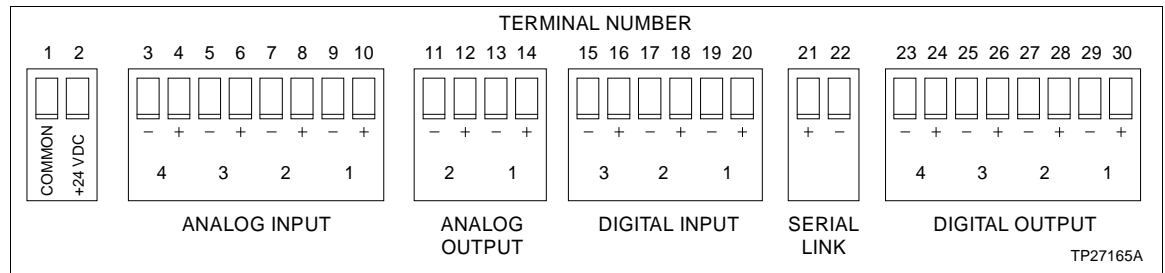


Figure C-1. NICS01 Terminal Assignments

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